

Status of buffalo diseases in Bangladesh in relation to casual agents and predisposing factors

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ABSTRACT

Although buffaloes play very important role in rural economy of Bangladesh, researches on buffalo diseases are surprisingly scarce in the country. Therefore, the study was undertaken to investigate the prevailing buffalo diseases in Bangladesh in order to help develop appropriate control and prevention measures. Both retrospective and prospective investigations on the incidence and prevalence of different buffalo diseases were conducted for a period of two years in different selected areas of the country. Laboratory analyses were conducted on biological samples to identify the causal agents for different diseases recorded. As high as 64.2% of the studied buffaloes were infected with one or more species of gastro-intestinal parasites. Younger animals were found to be more susceptible to both parasitic and protozoan infections but sex was found not to affect the incidence. Most of the non-parasitic enteritis was caused by *E. coli* (62.5%) and *Salmonella sp.* (29.16%). Clinical and subclinical mastitis were recorded in 23.68% and 31.57% of samples analyzed, respectively. The study unveiled a comprehensive scenario of buffalo diseases in Bangladesh in relation to casual agents and predisposing factors that are expected to serve as the key points to develop control and prevention strategies against the diseases of buffaloes in Bangladesh.

Keywords: GIT parasites, diarrhea, mastitis, buffalo calves, prevalence etc.

INTRODUCTION

In recent years, the Asian buffalo has attracted global concern. Buffalo is the dairy, draught and meat animal of Asia that contributes a lot to meet the increasing demand of animal protein in the world. Buffalo milk and meat production of the world are 60.33 and 3.08 million metric tons, respectively per year; most of which are coming from Asian buffaloes [1]. The Indian subcontinent is the home tract of the world's dairy buffaloes. Likewise, among the livestock in Bangladesh, buffaloes play an important role in domestic economy and trade and have the potentially to be used as a tool for poverty reduction.

As estimated, there are 544,000 buffaloes (*Bubalus bubalis*) spreading over Bangladesh which mainly depend on feed consists of grass and small quantities of agricultural wastes and by-products [2]. Buffalo is considered to be a multipurpose animal and after cattle they provide the major contribution of the livestock sector to the rural economy of Bangladesh [3]. In general, buffalo is regarded as more productive, healthier and more useful than the cow, especially for the poorest "backyard" farmers in Asia [4]. Nevertheless, the research on buffaloes has been much neglected in comparison to research on cattle [5]. Furthermore, research on buffaloes especially on their diseases is surprisingly scarce in Bangladesh. There seem no reports or scarcity of reports on prevalence and etio-epidemiological factors associated with buffalo diseases and their control in Bangladesh.

Infectious diseases have been recognized as one of the most important limiting factors for livestock including buffalo production all over the world [6]. Among many constrains, diseases are thought to be the major cause that hinder the development of livestock population including buffaloes in Bangladesh. Regardless the etiology, diseases bring heavy economic loss to the buffalo industry in Bangladesh in the form of mortality, lowered general health condition, retarded growth, lower work output, decreased milk and meat production etc. [7].

It seems that the diverse agro-climatic conditions, animal husbandry practices and pasture management are influencing the incidence and severity of various diseases of buffaloes in Bangladesh. But surprisingly, no systemic work has been documented till date on buffalo diseases and their management in Bangladesh. Therefore, the present study was undertaken with the aim to investigate different buffalo diseases prevailing in the selected regions of Bangladesh in order to assist in developing appropriate control and prevention measures against the diseases for better buffalo production.

MATERIALS AND METHODS

Study animals, area and period

Buffaloes of either sex and of any age were used as study subjects. Selected areas with high buffalo population including coastal areas of Bangladesh were considered as working area of the study for a

period of two year starting from July, 2012 to June, 2014.

Investigation on the overall disease scenario of buffaloes

Both retrospective and prospective investigation on the incidence and prevalence of different diseases of buffaloes were conducted in the study areas throughout the study period. Information on the disease related factors like health status, sex and age, vaccination, deworming, etc. were collected using a pretested standard questionnaire.

Collection and preservation of samples

Contact person(s) for each study area were selected for easy access to the necessary information including disease outbreak or incidence. In addition, farmers were contacted regularly either by direct visit or telephone (when possible) for any disease outbreak or incidence. Samples were collected from the diseased/dead animal and sent to the Animal Health Research Division (AHRD), Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka or to the Department of Medicine & Public Health Laboratory (MEPHL), Sher-e-Bangla Agricultural University (SAU), Dhaka maintaining standard procedure. Especial emphasis was given to the screening of as many samples as possible. Standard protocol for the sample collection, shipment and preservation were maintained accordingly. Collected samples were preserved at -20°C for future use. Samples were analyzed for the detection of parasitic, protozoan and bacteriological agents.

Fecal sample collection and examination for parasitic and protozoan infection

The fecal samples were collected directly from the rectum of the buffaloes or from the fresh fecal mass immediately after defecation. The samples were examined in the field and in the Laboratory of AHRD, BLRI or MEPHL, SAU soon after collection or were preserved for future study. The standard techniques and criteria as described by Soulsby [8] were followed for fecal examination and identification of parasitic eggs. Fecal samples were also tested for the presence of protozoa.

Bacteriological examination of fecal samples

Fecal samples for bacteriological analysis were collected aseptically and carried directly to the laboratory of AHRD, BLRI or MEPHL, SAU maintaining standard protocol. Causative organisms were isolated from the suspected samples using standard as well as specific culture methods. A total of 72 fecal samples from diarrheic animals were cultured in defibrinated sheep blood-

agar, MacConkey agar, Salmonella-Shigella agar and EMB agar. An aliquot of 0.5 g of each sample was diluted in 4.5 mL of sterile physiological water and roughly homogenized. Serial dilutions ranking from 10^{-3} to 10^{-7} were prepared. Afterwards, 100 μL of each dilution was plated in duplicate into defibrinated sheep blood-agar, MacConkey agar, Salmonella-Shigella agar and EMB agar. Plates were incubated for 24 to 48 h at 37°C . After this incubation time, plates were inspected, and those containing from 50 to 100 colonies were kept for a preliminary identification on the basis of cultural, morphological and biochemical characteristics.

Study on clinical and subclinical mastitis

To study the status of clinical and subclinical mastitis, a total of 114 milk samples were randomly collected from buffalo cows. All of the milk samples were subjected to visual inspection as well as California Mastitis Test (CMT). Most of the CMT was conducted at the field to diagnose subclinical mastitis. Clinical mastitis was diagnosed when there were visible or palpable signs of udder inflammation along with the changes in milk secretions. Milk samples were also brought to the laboratory of AHRD from un-treated diseased animals in the ice box for microbiological examination. Microbiological examination of milk samples begin within 8 hours of collection. Standard microbiological procedures were followed for culturing the milk samples and identification of mastitis pathogens. A volume of 0.01 ml of milk sample was streaked onto MacConkey's agar plate. Milk samples were cultured on a 100 mm plate by plating and incubated at 37°C for 48 hours. They were also cultured on blood agar at 37.0°C for 24 to 48 hours.

RESULTS AND DISCUSSION

The retrospective study findings revealed high incidence of Hemorrhagic septicemia (HS) and calf pneumonia (*C. pneumonia*), helminthiasis, enteritis and mastitis as the major disease problems for buffalo production in Bangladesh (Figure 1). Although HS and calf pneumonia were reported to be the major disease problems by the farmers and local vets, no incidence of such cases was recorded during the study period.

Therefore, etio-epidemiological factors for such cases were not identified during this study time. The study was conducted in some selected areas of Chittagong, Sylhet, Rajshahi, Barishal and Rangpur division which are well known for high buffalo population in Bangladesh. The scenario of disease status was almost same in the study areas. No

significant regional variation was recorded during the study period. Rather, high incidence of the aforementioned diseases was recorded throughout the country (Figure 2).

The prevalence of GIT parasites was alarming in buffaloes in all of the study areas. A total of 162 fecal samples were examined to determine the parasitic and protozoan burden, among them 104 (64.20%) buffaloes were found infected with one or more species of gastro-intestinal parasites (Figure 3). Six species of gastro-intestinal parasites were identified during feces examination, namely, *Paramphistomum cervi* (32.10%), *Fasciola gigantica* (21.60%), *Toxocara vitulorum* (5.56%), *Schistosoma indicum* (1.85%), *Strongyles* (1.85%), *Strongyloides* sp. (1.23%). In addition, fecal examination revealed the presence of the protozoan species namely, *Eimeria* sp. (4.94%) and *Balantidium coli* (38.89%) (Figure 3).

The parasitic and protozoan loads were related to the age of the host animal but sex was found not to affect the incidence (Figure 4). Animals of both sexes were almost equally susceptible to gastro-intestinal parasitic infection but younger animals were found to be more prone to GIT parasite and protozoa (Figure 4).

The present finding is in agreement with the earlier findings of Hossain [9] who recorded 24% fasciolosis in Bangladesh. Islam [10] reported that *Fasciola* infection in buffaloes varies from place to place. Similar findings were reported by Azam *et al.* [11] who revealed that 64.41% buffaloes are positive for internal parasites in Pakistan. Slightly lower prevalence was observed by Bachal *et al.* [12] who recorded 47% buffaloes suffering from different types of helminths in Pakistan. It might be assumed that the buffalo is exposed to a higher risk of infection with snail borne helminthes due to the animals tendency to seek rivers, pools or swamps for wallowing.

Asif *et al.*, also reported the higher prevalence of helminths infection in young buffaloes compared to adults in Pakistan [13]. But the present finding is in contrast to the previous reports of Alim (1997) who observed that infection rate of fasciolosis increased with the increase of age [14]. Baily also suggested that the fasciolosis is not as self limiting in the buffaloes as this in the cattle [15]. It is very difficult to explain exactly the frequent occurrence of gastrointestinal parasitic infection in young buffaloes. But it may be assumed that young buffaloes got more access to pasture land than the

calves to have the infection. On the other hand, adults developed immunity with the increase of age, so susceptibility decreased with increase of age. The results of the present investigation indicated that the prevalence of gastro-intestinal parasites in water buffaloes is very common and quite severe irrespective of age and sex of the buffaloes or of the region of the country. It is imperative that integrated strategies and measures be taken to control gastrointestinal parasitic infections in buffaloes in Bangladesh.

The analyses of 72 fecal samples from diarrheic animals determined the entero-pathogens responsible for diarrheal diseases in buffaloes. The microorganisms isolated were identified on the basis of cultural, morphological and biochemical characteristics. Bacteriological investigations revealed that 62.5% cases of diarrhea were associated with *E. coli* infection where as infection by *Salmonella* sp. was evident in 29.16% cases. Rest 8.33% cases were diarrhea of unknown origin (Figure 5).

In the current study, the total incidence of *E. coli* and *Salmonella* in diarrheic dairy buffaloes was nearly similar to the findings of Rana, [16]. In this study, the isolation rate of *Salmonella* was significantly higher in cross-breed buffalo calves than native breed buffalo calves. This finding indicated that the cross-breed buffalo calves were more susceptible to salmonella infection. Therefore, regular epidemiological investigations are important for prevention and control of salmonellosis in dairy farms.

To study the status of clinical and subclinical mastitis, a total of 114 milk samples were randomly collected from buffalo cows. The prevalence of clinical and subclinical mastitis in buffalo was found to be 23.68% and 31.57%, respectively. For bacteriological examination milk samples were inoculated on MacConkey and blood agar and incubated at 37.0°C for 24 to 48 hours. The microorganisms isolated were identified on the basis of cultural, morphological and biochemical characteristics. The most isolated pathogens responsible for mastitis in buffalo were the Coagulase Negative *Staphylococci* (CNSs). *Streptococcus* spp. and *Bacillus* spp. and *Staphylococcus aureus* (Figure 6).

These findings are in close alignment with the findings of Nooruddin *et al.*, [17] and Bilal *et al.*, [18]. The culture sensitivity test indicated that the disease causing organisms were highly sensitive to

Ciprofloxacin and gentamicin, moderately sensitive to Norfloxacin but resistant to amoxicillin, penicillin and erythromycin. These findings are in agreement with findings of Mustafa *et al.*, [19] and Sumathi *et al.*, [20] who also found gentamicin effective. Antibiotic resistance has become a global concern in the treatment of infectious diseases in both human and veterinary medicine. Therefore, the findings may be taken into account for the treatment of clinical and subclinical mastitis in buffaloes.

CONCLUSION

The study was designed for a duration of two years in order to develop a scientific database for prevailing buffalo diseases in Bangladesh which was unexplored for years. Since the development of a prevention and/or control measures against a disease depends on the prevailing status of that disease, through investigation was made to understand the overall disease status of buffaloes in Bangladesh. The prevalence and incidence of different diseases were studied in terms of different epidemiological factors. Thereafter, the etiological agents of different buffalo diseases were isolated and identified. The study findings revealed high incidence of GIT parasitic and protozoan infestation, diarrhea and mastitis as the major disease problems for buffalo production. Hemorrhagic septicemia and calf pneumonia were reported to be the major disease problems. The study revealed the prevailing status of buffalo diseases in some selected areas of Bangladesh that may be considered as the representative scenario of the overall status of buffalo diseases in Bangladesh. These findings will serve as the key points while designing the control and prevention measures against buffalo diseases in Bangladesh.

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AUTHOR CONTRIBUTIONS

K. B. M. Saiful Islam. conceived and designed the experiments; K. B. M. Saiful Islam, M. H. Rahman and M. H. Kabir performed field survey and data collection. K. B. M. Saiful Islam, M. H. B. Kabir, M. H. Rahman, M. H. Kabir performed the experiments; K. B. M. Saiful Islam analyzed the data; K. B. M. Saiful Islam wrote the paper.

CONFLICTS OF INTEREST

The authors declare no conflict of interest. The founding sponsors had no role in the design of the

study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results".

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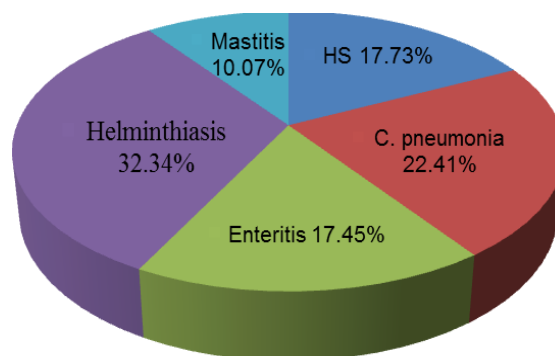


Figure 1: Overall diseases status of buffaloes in the selected regions of Bangladesh.

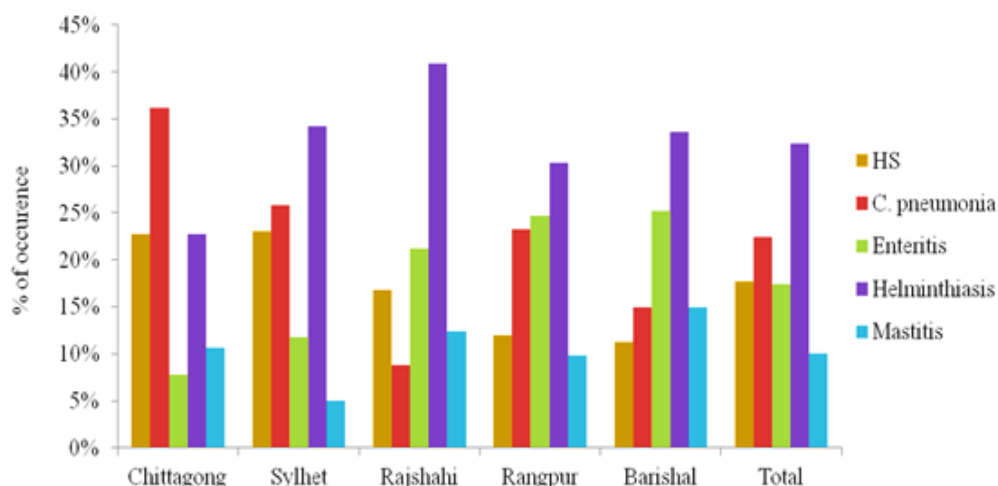


Figure 2: Statuses of buffalo diseases in different regions (Divisions) in Bangladesh.

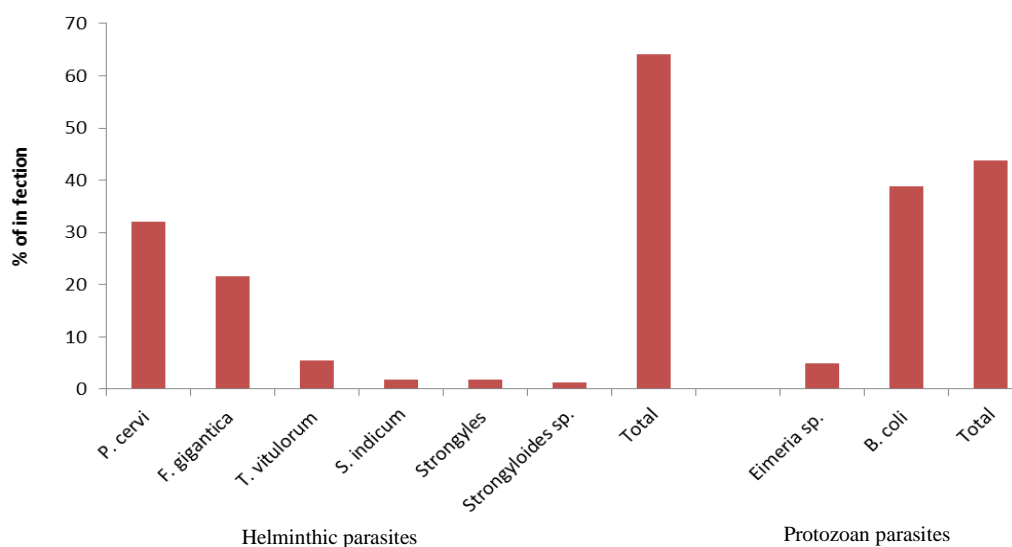


Figure 3: Occurrence of helminthic and protozoan parasitism in Bangladeshi buffaloes.

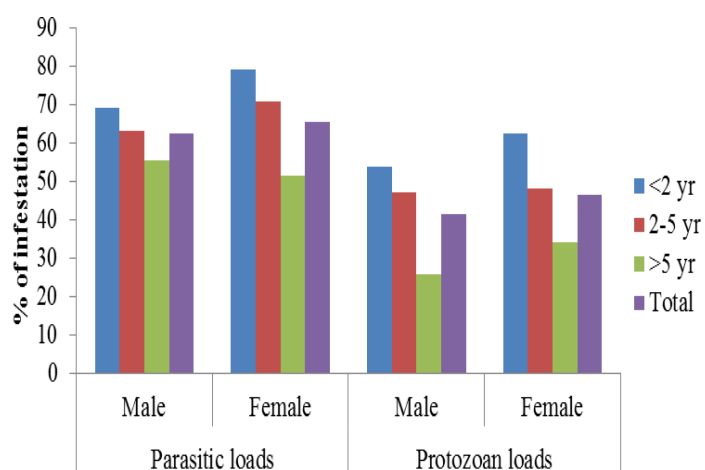


Figure 4: Age and sex prevalence of parasitic and protozoan infestation in buffaloes.

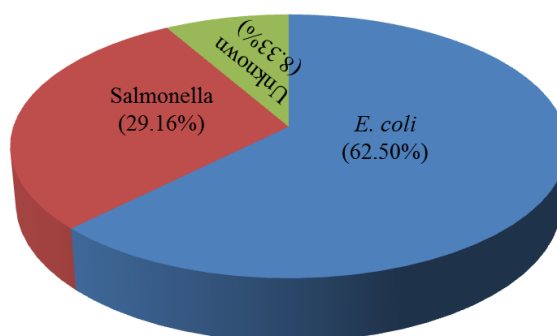


Figure 5: Enteropathogens responsible for diarrhea in buffaloes of Bangladesh

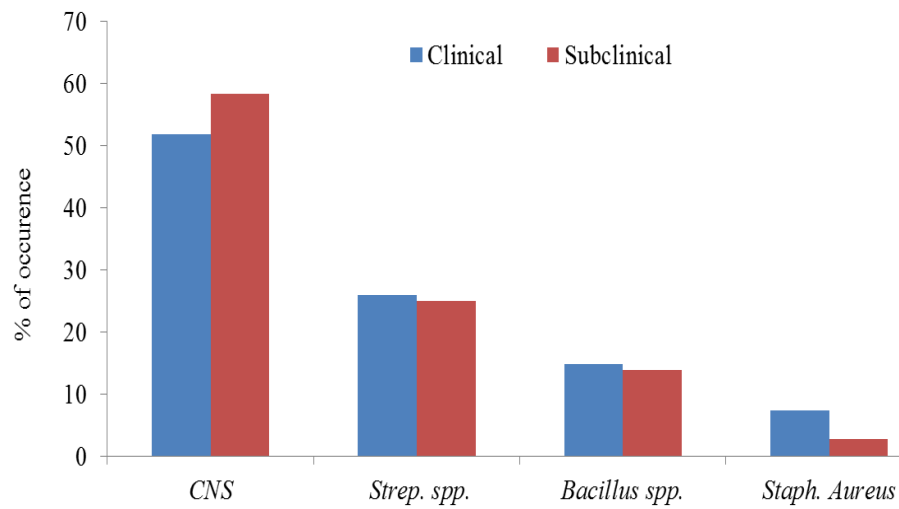


Figure 6: Causes of clinical and subclinical mastitis in dairy buffaloes